

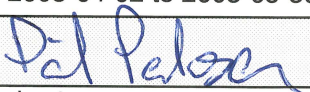
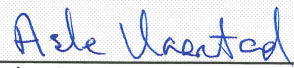



TEST REPORT

EN 50014 - EN 50019

Product	Self-limiting heating cables		
Name and address of the applicant	Peter Watmore Ltd. Roystone Lodge Chesterfeild Rd. Matlock, Derby, DE45LF U.K		
Name and address of the manufacturer	Fine Korea Co. Ltd., Inchon, 405-100 KOREA		
Name and address of the factory	Fine Korea Co. Ltd., Inchon, 405-100 KOREA		
Rating and principal characteristics	See page 2		
Trade mark (If any)	PW-FINE		
Model/type	SRL family		
Nemko Nr. Ex	03 ATEX 1279 X		
The code for the component / the electrical apparatus is	EEx e II T6-T5		
Additional information			
Tested according to	EN 50014: 97 + A1: 99 + A2: 99 Electrical apparatus for potentially explosive atmospheres General requirements		
	EN 50019: 00 Electrical apparatus for potentially explosive atmospheres Increased safety "e"		
Name and address of the testing laboratory	 P.O. Box 73 Blindern, N-0314 Oslo, Norway	Telephone	
		(+47) 22 96 03 30	
		Fax	
		(+47) 22 96 05 50	
Test sample(s) received	2002-12-18		
Tested in period	2003-04-02 to 2003-05-30. The test results relate only to the sample(s) tested.		
Tested by	 signature		2003-11-18
	Pål Pedersen name in block letters		date
Verified by	 signature		2003-11-18
	 Tomas Østgårdstrøen name in block letters		date

General remarks:

Description of equipment under test:

The SRL(F) and SRL(M) families of heating units are of the parallel circuit self-regulating type rated at up to 240V with a nominal power output from 10W/m to 50W/m at 10°C and a maximum self-limiting temperature of 85°C and 100°C.

Each trace heating unit comprises:

The active heating cable.

An end seal for terminating the remote end of the unit.

A gable gland for connecting the powered end of the unit to a suitable terminal enclosure, or alternative power connection systems.

The active heating cable comprises two stranded copper conductors around which is extruded a semi-conductive core material. This core material increases in resistance with increasing temperature and gives the cable its self-limiting property. The core is covered with a polymer jacket before being overbraided with tinned copper. A further layer of polymer jacket is applied. The declared maximum withstand temperature for the range is 85°C and 100°C

CABLE ACCESSORIES

Listed in Drawing No.

PW 1001 F, Rev 0, dated 10/6/2003

PW 1002 M, Rev 0, dated 10/6/2003

Type Designation

SRF 30-2-CT

SR

F

30

2

CT

Is the sheath identification
CR for polyolefin, **CT** for Fluoropolymer

Is the voltage rating
2 for 240V, **1** for 110V

Is the power rating in approximate watts per meter at 10°C


Is the heater family
F = 85°C (**T6**), **M** = 100°C(**T5**)

Copy of marking plate:

PWL FINE SELFREGULATING HEATING CABLE (SRF or SRM) (30)-(2)(CR)

30W/m) at 10 deg C (240 or 110 VAC) MAX 300VAC

MAX EXPOSURE TEMP (85C oe 100C) BATCH NUMBER

CE 0470  II2G EEx e (T6 or T5) Nemko03ATEX1279X

General remarks:

Throughout this report a comma is used as the decimal separator.

Possible test case verdicts:

P = Pass, **F** = Fail, **N** = Not applicable. Placed in the column to the right (Verdict)

Tested according to additional information:

National requirements:

Other requirements:

Additional information:

Calibration: All instruments used in the tests given in this test report are calibrated and traceable to national or international standards.
Further information about traceability will be given on request.

Measurement uncertainty: Measurement uncertainties are calculated for all instruments and instrument set-ups given in this report. Calculations are based on the principles given in the standard EA-4/02 (Dec. 1999).
Further information about measurement uncertainties will be given on request

Evaluation of results: If not explicitly stated otherwise in the standard, the test is passed if the measurement value is equal to or below the limit line, regardless of the uncertainty of the measurement. If the measurement value is above the limit line, the test is not passed - ref. IECEE/CTL (Sec) 056/94 (CLT = Committee of Testing Laboratories).
The instrumentation accuracy is within limits agreed by this committee (ref. Nemko proc. P227).

Name and address of additional production-sites (factories):

Information about other standards / documents considered:

Tested according to national requirements for the following countries:

List of appendixes / enclosures to the test report:

Clause	Requirement - Test	Result - Remark	Verdict
1	SCOPE	The equipment is covered by this standard.	
2	PUBLICATIONS	This clause contains no requirements	
3	DEFINITIONS AND SYMBOLS	This clause contains no requirements	
	REQUIREMENTS FOR ALL ELECTRICAL APPARATUS		
4	APPARATUS GROUPING AND TEMPERATURE CLASSIFICATION		
4.1	Electrical apparatus for potentially explosive atmospheres is divided into:		
	<ul style="list-style-type: none"> Group I Electrical apparatus for mines susceptible to fire damp 		N
	<ul style="list-style-type: none"> Group II Electrical apparatus for places with a potentially atmosphere, other than mines susceptible to fire damp 		P
4.2	Electrical apparatus of Group II may be subdivided according to the nature of the potentially explosive atmosphere for which it is intended.		
4.2.1	Types of protection flameproof enclosure "d", and intrinsic safety "i", subdivision of electrical apparatus of Group II	EEx e II	N
4.2.2	For all types of protection, apparatus of Group II shall be marked as a function of its maximum surface temperature according to 5.1.2		P
4.3	The electrical apparatus may be tested for a particular explosive atmosphere. In this case it shall be certified and marked accordingly		N
5	TEMPERATURES		
5.1	Maximum surface temperature		
5.1.1	For electrical apparatus of Group I the maximum surface temperature shall be specified in relevant documentation(23.2):		N
	This temperature shall not exceed:		
	<ul style="list-style-type: none"> 150°C on any surface where coal dust can form a layer 		N
	<ul style="list-style-type: none"> 450°C where coal dust is not expected to form a layer, provided that: 		N
	a) the actual maximum surface temperature is marked on the apparatus, or		N
	b) the symbol "X" is placed after the certificate reference to indicate the conditions for safe use		N
5.1.2	Group II electrical apparatus shall be arranged and marked (27.2 (f)) and shall either		

Clause	Requirement - Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> preferably classified in a temperature class 	See F.4.3	P
	<ul style="list-style-type: none"> or, defined by the actual maximum surface temperature 		N
	<ul style="list-style-type: none"> or, if appropriate, restricted to the specific gas for which it is intended 		N
5.2	Ambient temperatures		
	Normal (additional marking none)	- 20°C to + 40°C	N
	Special stated by manufacturer and stated in the certificate	- 40°C to + 40°C	P
	<ul style="list-style-type: none"> Additional marking 		N
5.3	Surface temperature and ignition temperature		N
6	GENERAL		
6.1	Electrical apparatus for use in potentially explosive atmospheres shall:		
	a) comply with the requirements of this European Standard as modified by the specific European Standards for the type(s) of protection as listed in 1.2;	EN 50019 included	P
	b) be constructed in accordance with the principle of good engineering practice in safety matters.		P
6.2	Enclosures which can be opened more quickly than the time necessary:		
	<ul style="list-style-type: none"> to allow incorporated capacitors, charged by a voltage of 200V or more, to discharge to a value of residual energy of: 		N
	<ul style="list-style-type: none"> or allow the cooling of enclosed hot components to a surface temperature below the temperature class of the electrical apparatus 		N
	shall be marked with a warning		N
7	NON-METALLIC ENCLOSURES AND NON-METALLIC PARTS OF ENCLOSURES		
	The following requirements, also those of 23.4.7, apply to:		
	<ul style="list-style-type: none"> non metallic enclosures 		N
	<ul style="list-style-type: none"> non metallic parts of the enclosures, on which the type of protection depends 		P
	For sealing rings (3.19) the proof furnished according to B3.3 is sufficient		N
7.1	Definition of the material		
7.1.1	The documents according to 23.2 shall define both the material and the manufacturing process		N

Clause	Requirement - Test	Result - Remark	Verdict
7.1.2	For plastic materials , the definition shall include:		
	<ul style="list-style-type: none"> the name of the manufacturer 	Raychem	P
	<ul style="list-style-type: none"> the exact and complete reference of the material, its colour, as well as the kind and percentage of fillers and other additives when they are included 		N
	<ul style="list-style-type: none"> the possible surface treatments 		N
	<ul style="list-style-type: none"> the temperature index "TI" 		N
7.1.3	It is not required to verify compliance of the material with its definition		N
7.2	Thermal endurance		
	TI at least 20K greater than the hottest point of the enclosure or part of the enclosure	Max. ambient = °C	N
	The endurance to heat and cold satisfactory (see 23.4.7.3 and 23.4.7.4)	2 weeks in 95°C 95% rel.hum 2 weeks in 130	P
7.3	Electrostatic charges of enclosures or parts of enclosures of plastic materials.		
	Applies only for:		
	<ul style="list-style-type: none"> non-fixed electrical apparatus 		N
	<ul style="list-style-type: none"> fixed apparatus with plastic parts that are likely to be rubbed or cleaned on site 		N
7.3.1	Electrical apparatus of group I		
	Enclosures of plastic material with surface area projected in any direction of more than 100cm ² , shall be so designed that under normal conditions of use, maintenance and cleaning, danger of ignition due to electrostatic charges is avoided.		N
	This requirement shall be satisfied by suitable selection of the material so that the insulation resistance of the enclosure, measured in accordance with 23.4.7.8, does not exceed 1GΩ or		N
	by virtue of the size, shape and lay-out, or other protective methods, shall be such that dangerous electrostatic charges are not likely to occur.		N
	If, however, the danger of ignition cannot be avoided in the design of the apparatus a warning label shall indicate the safety measures to be applied in service.		N
7.3.2	Electrical apparatus of group II		

Clause	Requirement - Test	Result - Remark	Verdict
	Enclosures shall be so designed that under normal conditions of use, maintenance and cleaning, danger of ignition due to electrostatic charges is avoided. Shall be satisfied by any one of a) or b) or c) below.		N
	a) suitable selection of the material so that the insulation resistance of the enclosure, measured in accordance with 23.4.7.8, does not exceed $1G\Omega$		N
	b) limitation of the surface area, projected in any direction, of plastic enclosures or plastic parts of enclosures as follows		
	<ul style="list-style-type: none"> for Group IIA and IIB apparatus to a maximum of 100 cm^2 except that this may be increased to a maximum of 400 cm^2 if the exposed areas of plastic are surrounded by conductive earthed frames 		N
	<ul style="list-style-type: none"> for Group IIC apparatus, including light transmitting parts, to a maximum of 20 cm^2 except that this may be increased to a maximum of 100 cm^2 if the plastic parts are additionally protected against the occurrence of dangerous electrostatic charges. 		N
	c) by virtue of the size, shape and lay-out, or other protective methods, shall be such that dangerous electrostatic charges are not likely to occur.		N
	If, however, the danger of ignition cannot be avoided in the design of the apparatus a warning label shall indicate the safety measures to be applied in service.	The heater is equipped with a screen connected to ground	N
7.4	Threaded holes		
	Threaded holes for fasteners which secure covers intended to be opened in service for adjustment, or inspection etc. may only be tapped into the plastics material when the thread form is compatible with the plastic material of the enclosure		N
8	ENCLOSURES CONTAINING LIGHT MATERIALS		
8.1	Materials used in Group I apparatus shall not contain by weight	See also 8.3	
	a) more than 15% in total of aluminium, magnesium and titanium and		N
	b) more than 6% in total of magnesium and titanium		N
	Materials used in Group II apparatus shall not contain by weight: more than 6% of magnesium		N

Clause	Requirement - Test	Result - Remark	Verdict
8.2	Threaded holes for fasteners which secure covers intended to be opened in service for adjustment, or inspection etc. may only be tapped into the material when the thread form is compatible with the material used for the enclosure		N
	The provisions of 8.1 do not apply to Group I surveying instruments carried by persons.		N
9	FASTENERS		
9.1	General		
	Parts used to prevent access to uninsulated live parts, released or removed only with the aid of a tool.		N
	Fastening screws for enclosures of materials containing light metals may be made of light metal or plastics if the material of the fastener is compatible with that of the enclosure		N
9.2	Special fasteners		
	<ul style="list-style-type: none"> the thread shall be coarse pitch in accordance with ISO 262, with a tolerance fit of 6g/6H in accordance with ISO 965 		N
	<ul style="list-style-type: none"> the head of the screw or nut shall be in accordance with ISO 4014, ISO 4017, ISO 4032 or ISO 4762, and in case of hexagon socket set screws ISO 4026, ISO 4027, ISO 4028 or ISO 4029. 		N
	<ul style="list-style-type: none"> the holes of the electrical apparatus shall comply with the requirements of 9.3 		N
9.3	Electrical apparatus - Holes for special fasteners		
9.3.1	Height of thread		N
9.3.2	The thread shall have a tolerance of fit of 6H in accordance with ISO 965, and either:		N
	a) the hole under the head of the associated fastener shall allow a clearance not greater than a medium tolerance fit of H13 in accordance with ISO 286-2 (see figure 1 and ISO 273); or		N
	b) the hole under the head (or nut) of an associated reduced shank fastener shall be threaded to enable the fastener to be retained. The dimensions of the threaded hole shall be such that the surrounding surface in contact with the head of such a fastener shall be at least equal to that of a fastener with reduced shank in a clearance hole		N

Clause	Requirement - Test	Result - Remark	Verdict
9.3.3	In case of hexagon socket set screws the screw thread shall have a tolerance of fit of 6H in accordance with ISO 965 but shall not protrude from the threaded hole after tightening		N
10	INTERLOCKING DEVICES		
	Interlocking devices used to maintain a type of protection shall be so constructed that their effectiveness cannot readily be defeated by the use for example of a screwdriver or pliers.		N
11	BUSHINGS		
	Bushings used as connection facilities and which may be subjected to a torque while the connection or disconnection is being made shall be mounted in such a way that all parts are secured against turning. Test 23.4.5.		N
12	MATERIALS USED FOR CEMENTING		
12.1	The manufacturer's documents submitted according to 23.2 testify		
	<ul style="list-style-type: none"> materials used for cementing 		N
	<ul style="list-style-type: none"> thermal stability adequate for the maximum temperature. Exceeds max. temp. by at least 20K 		N
12.2	The testing station is not required to verify the characteristics listed in the documents mentioned in 12.1		N
13	Ex COMPONENTS		
13.1	Compliance with Annex C		
	a) an empty enclosure		N
	b) components or assemblies of components for use with apparatus complying with the requirements of one or more of the types of protection listed in 1.2	See drawings PW 1001F PW 1002M PW1003 PW1004	P
13.2	Ex-components may be mounted:		
	a) completely within an apparatus enclosure		N
	b) completely external to the apparatus enclosure		N
	c) partly within and partly external to the apparatus enclosure		N
13.3	Mounting completely within the enclosure the only parts to be tested or assessed when used in an apparatus are those parts which cannot be tested and/or assessed as a separate component		N

Clause	Requirement - Test	Result - Remark	Verdict
13.4	Mounting external to the enclosure or partly within and partly external to the enclosure compliance with the relevant type of protection and compliance with the mechanical tests according to 23.4.3		N
14	CONNECTION FACILITIES AND TERMINAL COMPARTMENTS		
14.1	Apparatus which is intended for connection to external circuits shall include connection facilities, except	Connection of the powered end of the unit is to be made to a suitable terminal enclosure, or alternative power connection systems	P
	apparatus constructed with permanently connected unterminated cable	shall be marked with the symbol "X"	P
14.2	Terminal compartments and their access openings shall be dimensioned so that the conductors can be readily connected		P
14.3	Terminal compartments shall comply with one of the European Standards listed in 1.2		N
14.4	Terminal compartments shall be so designed that after proper connection of the conductors, the creepage distances and clearances comply with the requirements, if any, of the specific European Standard for the type of protection concerned		N
14.5	The contact pressure of electrical connections shall not be affected by dimensional changes service (due to temperature, humidity, etc.) of insulating material.		N
	In the particular case of plastics walled enclosures provided with an internal earth continuity plate, the test of 23.4.7.9 shall be applied.		N
15	CONNECTION FACILITIES FOR EARTHING OR BONDING CONDUCTORS		
15.1	Connection facility shall be provided inside the terminal compartment and near the other connection facilities		N
15.2	Electrical apparatus with a metallic enclosure shall have additional external connection facility		N
	This external connection facility shall be electrically in contact with the facility required in 15.1		N
15.3	Neither an internal nor external earthing or bonding connection facility is required for electrical apparatus for which earthing is not required, such as electrically apparatus having double or reinforced insulation or		N

Clause	Requirement - Test	Result - Remark	Verdict
	for which supplementary earthing is not necessary		N
15.4	Effective connection of at least one conductor with a cross sectional area as in Table 3		N
	Connection facilities on the outside shall provide for effective connection of a conductor of at least 4mm ²		N
15.5	Connection facilities shall effectively be:		
	<ul style="list-style-type: none"> protected against corrosion 		N
	<ul style="list-style-type: none"> also be designed so that the conductors are secured against loosening and twisting and 		N
	<ul style="list-style-type: none"> so that the contact pressure is maintained 		N
	Special precautions shall be taken if one part consists of a material containing light metal		N
16	CABLE AND CONDUIT ENTRIES		
16.1	The manufacturer shall specify in the documents submitted according to 23.2 of this standard:		
	<ul style="list-style-type: none"> the entries intended for use with cable or conduit 	The entry is a EEx e certified gland	P
	<ul style="list-style-type: none"> their position on the apparatus and the maximum number permitted 		N
16.2	Cable and conduit entries shall be constructed and fixed so that they do not alter the specific characteristics of the type of protection of the electrical apparatus on which they are mounted.		N
	This shall apply to the whole range of cable dimensions specified by the manufacturer of the cable entries as suitable for use with those entries		N
16.3	Cable and conduit entries may form an integral part of the apparatus or an inseparable part of the enclosure of the apparatus.		N
16.4	Cable entries, whether integral or separate, shall meet the relevant requirements of Annex B		N
16.5	Where the design of Group I cable entry is such that twisting of the cable can be transmitted to the connection then an anti-rotation device shall be fitted.		N
16.6	Entry by conduit shall be either by screwing into threaded holes or by locking in plain holes:		
	<ul style="list-style-type: none"> in the wall of enclosure or 		N

Clause	Requirement - Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> in an adaptor plate designed to be fitted in or on the walls of the enclosure or 		N
	<ul style="list-style-type: none"> into a suitable stopping box, integral with or attached to the wall of the enclosure 		N
16.7	Blanking elements		
	<ul style="list-style-type: none"> satisfy the requirements of the specific type of protection concerned 		N
	<ul style="list-style-type: none"> can be removed only with the aid of a tool 		N
16.8	When the temperature under rated conditions is higher than 70°C at the cable or conduit entry point, or 80°C at the branching point of the conductors, the outside of the electrical apparatus shall be marked		N
SUPPLEMENTARY REQUIREMENTS FOR CERTAIN ELECTRICAL APPARATUS			
17	ROTATING ELECTRICAL MACHINES		
	External shaft driven cooling fans of rotating electrical machines shall be enclosed by a fanhood which is not considered to be part of the enclosure of the electrical apparatus. Such fan shall meet the following requirements:		
17.1	Ventilating openings for external fans		
	The degree of protection (IP) of ventilation openings for external fans of rotating electrical machines shall be at least:		
	<ul style="list-style-type: none"> IP 20 on the air inlet side (EN 60034-5) 		N
	<ul style="list-style-type: none"> IP 10 on the air outlet side (EN 60034-5) 		N
	For vertical rotating machines rotating machines, foreign bodies shall be prevented from falling into ventilation openings		N
	For group I rotating electrical machines IP10 is adequate only when the openings are designed or arranged so that foreign bodies with dimensions above 12,5mm cannot be carried onto the moving parts of the machine either by falling vertically or by vibration		N
17.2	Construction and mounting of the ventilating systems		
	Fan and fanhoods and ventilation screens shall be constructed so as to meet the requirements of the resistance to impact test according to 23.4.3.2 and the required results according to 23.4.3.3		N
17.3	Clearances for the ventilating systems		

Clause	Requirement - Test	Result - Remark	Verdict
	In normal operation the clearances, taking into account design tolerances, between the external fan and its hood, ventilation screens and their fasteners shall be at least 1/100 of the maximum diameter of the fan, except that the clearances need not exceed 5mm and		N
	may be reduced to 1mm if the opposing parts are manufactured so as to have dimensional accuracy and stability.		N
	In no case shall the clearance be less than 1mm		
17.4	Materials for external fans and fanhoods		
17.4.1	Except for fans fitted to Group II rotating electrical machines and having a peripheral speed below 50m/s, external fans, fanhoods, ventilation screens etc., shall have an electrical insulation resistance, measured according to 23.4.7.8 of this standard not exceeding 1 GΩ		N
17.4.2	Thermal stability of plastic materials shall be considered adequate if the manufacturer's specified operating temperature of the materials exceeds the maximum temperature to which the material will be subjected in service by at least 20K		N
17.4.3	The external fans, fanhoods, ventilation screens, of rotating electrical machines, manufactured from materials containing light metals shall not contain by weight:		
	<ul style="list-style-type: none"> for Group I electrical machines more than 15% in total of aluminium, magnesium and titanium, and more than 6% in total of magnesium and titanium 		N
	<ul style="list-style-type: none"> for Group II electrical machines, more than 6% of magnesium 		N
18	SWITCHGEAR		
18.1	Switchgear with contacts immersed in flammable dielectric is not permitted		N
18.2	Disconnectors (which are not designed to be operated under the intended load) shall:		
	<ul style="list-style-type: none"> be electrically or mechanically interlocked with a suitable load breaking device, or 		N
	<ul style="list-style-type: none"> for Group II apparatus only, be marked at a place near the actuator of the disconnector with the warning 	"DO NOT OPERATE UNDER LOAD"	N
18.3	Where switchgear includes a disconnectors, the latter		N
	<ul style="list-style-type: none"> shall disconnect all poles and 		N

Clause	Requirement - Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> shall be designed so that the position of disconnecter contacts is visible or 		N
	<ul style="list-style-type: none"> their open position shall be reliably indicated 		N
	Any interlock between such disconnecter and the cover or door of the switchgear shall allow this cover or door to be opened only when separation of the disconnecter contacts is effective		N
18.4	The operating mechanism of disconnectors for Group I switchgear shall be capable of being padlocked in the open position.		N
18.5	For Group 1 switchgear provision shall be made to enable short-circuit and earth fault relays, if used, to latch out.		N
	If the switchgear has a local resetting device which is accessible from the outside of the enclosure, its access cover shall have a special fastener according to 9.2		N
18.6	Doors and covers giving access to the interior of enclosures containing remotely operated circuits with switching contacts which can be made or broken by non-manual influence shall either:		
	i) be interlocked with a disconnecter which prevents access to the interior unless it has been operated to disconnect unprotected internal circuits; or		N
	ii) be marked with the warning	"DO NOT OPEN WHEN ENERGIZED"	N
	In case of (i) above, where it is intended that some internal parts will remain energized after operation of the disconnecter, those energized parts shall be protected by either (a) or (b) below:		
	(a) one of the types of protection listed in 1.2;		N
	(b) protection as follows:-		
	<ul style="list-style-type: none"> clearances and creepage distances between phases (poles) and to earth in accordance with EN 50019; and 		N
	<ul style="list-style-type: none"> an internal supplementary enclosure IP 20 so arranged that a tool cannot contact the energized parts through any openings 		N
	<ul style="list-style-type: none"> marking on the internal supplementary enclosure with the warning 	"DO NOT OPEN WHEN ENERGIZED"	N

Clause	Requirement - Test	Result - Remark	Verdict
19	FUSES		
	Enclosures containing fuses shall:		
	<ul style="list-style-type: none"> be interlocked so that insertion or removal of replaceable elements can be carried out only with the supply disconnected and so that the fuses cannot be energized until the enclosure is correctly closed, or 		N
	<ul style="list-style-type: none"> alternatively the apparatus shall be marked with the warning 	"DO NOT OPEN WHEN ENERGIZED"	N
20	PLUGS AND SOCKETS		
20.1	Plugs and sockets shall comply with either a) or b) below:		
	a) be interlocked mechanically, or electrically, or otherwise designed so that they cannot be separated when the contacts are energized and the contacts cannot be energized when the plug and socket are separated, or		N
	b) be fixed together by means of special fasteners according to 9.2 and the apparatus marked with the warning	"DO NOT SEPARATE WHEN ENERGIZED"	N
20.2	Excluded from requirements		N
20.3	Plugs with components remaining energised when not engaged with a socket are not permitted		N
21	Luminaires		
21.1	The source of light of luminaires shall be protected by a light transmitting cover which may be provided with and additional guard comprising a mesh of not greater than 50mm squares.		N
	If mesh size exceed 50mm squares then the luminaire cover shall be considered as unguarded		N
	The light transmitting cover and, if provided, the guard, shall be capable of passing the relevant test according to 23.4.3.1.		N
	The mounting of luminaires shall not depend on a single screw.		N
	A single eyebolt may be used only if this is an integral part of the luminaire.		N

Clause	Requirement - Test	Result - Remark	Verdict
21.2	Except in the case of intrinsically safe luminaires to EN 50020, covers giving access to the lampholder and other internal parts of luminaires shall either:		
	(i) be interlocked with a device which automatically disconnects all poles of the lampholders as soon as the cover opening procedure begins or		N
	(ii) the apparatus shall be marked with the warning	"DO NOT OPEN WHEN ENERGIZED"	N
	In the case of (i) above, where it is intended that some parts other than the lampholder will remain energized after operation of the disconnecting device, then in order to minimise the risk to maintenance personnel, those energized parts shall be protected by either (a) or (b) below:		
	(a) one of the specific types of protection listed in 1.2		N
	(b) protection as follows:		
	<ul style="list-style-type: none"> clearances and creepage distances between phases (poles) and to earth in accordance with the requirements of EN 50019 type of protection 'e' and 		N
	<ul style="list-style-type: none"> an internal supplementary enclosure (which can be the reflector for the light source) which contains the energized parts and provides a degree of protection of at least IP30, according to EN 60529, so arranged that a tool cannot contact the energized parts through any openings and 		N
	<ul style="list-style-type: none"> marking on the internal supplementary enclosure with the warning 	"DO NOT OPEN WHEN ENERGIZED"	N
21.3	Lamps containing free metallic sodium e.g. low pressure sodium lamps in accordance with HD 219 S3) are not permitted. High pressure sodium lamps (e.g. in accordance with EN 60662) may be used		N
22	CAPLIGHTS, CAPLAMPS, HANDLAMPS AND BATTERIES		
22.1	Caplights for Group I		
	The requirements for miner's caplights are contained in EN 50033		N
22.2	Caplamps for Group II and handlamps		
22.2.1	Leakage of the electrolyte shall be prevented in all positions of the apparatus.		N

Clause	Requirement - Test	Result - Remark	Verdict
22.2.2	Where the source of light and the source of supply are housed in separate enclosures, which are not mechanically connected other than by an electric cable, the cable entries and the connecting cable shall be tested as appropriate according to B.3.1 or B.3.2 of annex B.		N
22.3	Apparatus incorporating cells and batteries		
22.3.1	The requirements in 22.3.1.1 to 22.3.1.12 below shall apply for all cells and batteries incorporated into explosion protected apparatus:		
22.3.1.1	Batteries incorporated into explosion protected apparatus shall be formed only from cells connected in simple series		N
22.3.1.2	Only cell types referred to in published IEC or CENELEC cell standards and having known characteristics shall be used.		N
22.3.1.3	All cells in a battery shall be of the same electrochemical system, cell design and rated capacity.		N
22.3.1.4	All batteries shall be arranged and operated so as to be within the allowable limits defined by the cell or battery manufacturer.		N
22.3.1.5	Batteries shall not contain a mixture of primary and secondary cells.		N
22.3.1.6	Primary and secondary cells or batteries shall not be used inside the same apparatus enclosure if they are readily interchangeable.		N
22.3.1.7	Primary batteries shall not be re-charged. Where another voltage source exists inside apparatus containing primary batteries and there is a possibility of interconnection, precautions shall be taken to prevent charging current passing through them.		N
22.3.1.8	Batteries shall not contain cells made by different manufacturers.		N
22.3.1.9	All cells shall be constructed, or arranged so as to prevent leakage of electrolyte, which would adversely affect the type of protection or components which safety depends.		N
22.3.1.10	Only the manufacturer's recommended method(s) of making electrical connections to a battery shall be used.		N
22.3.1.11	Where a battery is mounted inside apparatus and its orientation is important for safe operation, the correct orientation of the apparatus shall be indicated on the outside of the apparatus enclosure.		N

Clause	Requirement - Test	Result - Remark	Verdict
22.3.1.12	Where it is necessary for the user to replace cells or batteries contained within an enclosure, the relevant parameters to allow correct replacement shall be legibly and durably marked on or inside the enclosure, or detailed in the manufacturer's instructions.		N
	That is, either the manufacturer's part number, or the name of the cell or battery manufacturer, the electrochemical system, nominal voltage and rated capacity		N
	VERIFICATIONS AND TESTS		
23	TYPE VERIFICATIONS AND TESTS		
23.1	General		
	The type verifications and tests are intended to verify that a prototype or sample of the electrical apparatus complies with the relevant requirements of this standard and with the relevant requirements of the European Standard for the specific type of protection concerned		P
23.2	Verification of documents		
	Verification of the documents submitted by manufacturer give a full and correct specification of the explosion safety aspects of the electrical apparatus.		P
	Verification that in design of the electrical apparatus the requirements of this European Standard and of the specific European Standards for the types of protection concerned have been observed		P
23.3	Compliance of prototype or sample with documents		
	Verification that the prototype or sample of the electrical apparatus submitted for the type tests complies with the manufacturer's documents referred to above.		P
23.4	Type tests		
23.4.1	General		
23.4.2	Each test shall be made in that configuration of the apparatus which is considered to be the most unfavourable		P
23.4.3	Mechanical tests		
23.4.3.1	Test for resistance to impact		
	For light-transmitting parts made of glass, the test shall be made on three samples but only once on each.		N

Clause	Requirement - Test	Result - Remark	Verdict
	In all other cases the test shall be made on two samples, at two separate places on each sample.	See Annex F of EN 50019	N
	When an electrical apparatus is submitted to tests corresponding to low risk of mechanical danger , it shall be marked with the symbol X		N
	The test is carried out at an ambient temperature of $(20 \pm 5)^{\circ}\text{C}$, except where the material data shows it to have a reduction in resistance at lower temperatures within the specified temperature range.		N
	When the electrical apparatus has an enclosure or part of an enclosure in plastics material, the test shall be carried out at the upper and lower temperatures according to 23.4.7.1		N
	Impact energy test.	joules	N
23.4.3.2	Drop test		N
	In addition to being submitted to impact test according to 23.4.3.1, handheld electrical apparatus or electrical apparatus carried on the person, ready for use, shall be dropped four times from a height of 1m on a horizontal concrete surface.		N
	For apparatus with an enclosure in other than plastics material the test shall be carried out at a temperature of $(20 \pm 5)^{\circ}\text{C}$, except where the material data shows it to have a reduction in resistance at lower temperatures within the specified temperature range.		N
	For electrical apparatus which has enclosures or parts of enclosures made of plastic material the test shall be carried out at the lower ambient temperature according to 23.4.7.1.		N
23.4.3.3	Required results		
	The resistance to impact and drop test shall not produce damage invalidating the type of protection of the electrical apparatus.		N
	Superficial damage, chipping to paint work, breakage of cooling fins or other similar parts of the electrical apparatus, and small dents shall be ignored.		N
	External fanhoods and ventilation screens shall resist the tests without displacement or deformation causing rubbing by the moving parts.		N
23.4.4	Test for the degree of protection (IP) by enclosures		

Clause	Requirement - Test	Result - Remark	Verdict
	The test procedures and acceptance criteria shall be accordance with EN 60529, except as follows:		N
	<ul style="list-style-type: none"> for rotating electrical machines they shall be in accordance with EN 60034,-5 		N
	Where the manufacturer specifies criteria more onerous than those described in EN 60529 or EN 60034, these shall be applied unless they adversely affect explosion protection.		N
	Where EN 60529 is applied apparatus shall be considered as Category (1) as specified in Clause 13.4 of that standard.		N
	When tested in accordance with EN 60529, the apparatus shall not be energised.		N
	The dielectric test specified in Clause 12.3.2 of EN 60529 shall be carried out at $(2U_n + 1000) \pm 10\%$ volts rms. applied between 10 and 12 seconds where U_n is the maximum rated or internal voltage of the apparatus.		N
	Where a European Standard for Electrical Apparatus for Potentially Explosive Atmosphere requires acceptance criteria for IPXX, these shall be applied instead of those EN 60529 or EN 60034-5		N
	The acceptance criteria in EN 60034, Part 5 shall be applied to rotating electrical machines insofar as compliance with European Explosion Protection standard is concerned in addition to their normal operating conditions.		N
23.4.5	Torque test for bushings		
	Bushings used for connection facilities and which are subjected to torque during connection or disconnection of conductors shall be tested for resistance to torque.		N
	Neither the stem in the bushing nor the bushing when mounted shall turn when the stem is subjected to a torque		N
23.4.6	Thermal tests		
23.4.6.1	Temperature measurements		
	The thermal tests shall be made at the rating of the electrical apparatus, with the exception of the thermal test to determine the maximum surface temperature. The latter test is performed with the most adverse conditions at the most unfavourable supply voltage between 90% to 110% of the rated voltage of the electrical apparatus unless	See Annex F of EN 50019. clause F.4.3	P

Clause	Requirement - Test	Result - Remark	Verdict
	the manufacturer can demonstrate that other European Standards or CENELEC Harmonization Documents prescribe other tolerances for equivalent industrial electrical apparatus		P
	The measured maximum surface temperature shall not exceed:		
	<ul style="list-style-type: none"> for Group I electrical apparatus, those values as given in 5.1.1 		N
	<ul style="list-style-type: none"> for Group II electrical apparatus where each manufactured sample is routinely submitted to the thermal test: the temperature as marked on the electrical apparatus 		P
	<ul style="list-style-type: none"> for Group II electrical apparatus where the electrical apparatus is subjected to type testing, the marked temperature, or the temperature class, less 5K for temperature classes T6, T5, T4, and T3, and less 10K for temperature classes T2 and T1. 	See clause F.4.3 of EN 50019	P
	The result shall be corrected for the maximum ambient temperature specified in the rating.	$T_a = 40^{\circ}\text{C}$	P
	For electrical apparatus which can normally used in different positions, the temperature in each position is to be determined and the highest temperature is to be considered.		N
	When the temperature is determined for certain positions only the apparatus shall be marked either by the symbol "X" marking or by a label.		N
	Temperature of the hottest point of any enclosure, or part of enclosure, of plastic material.		N
23.4.6.2	Thermal shock test		
	Glass parts of luminaires and windows of electrical apparatus shall withstand, without braking, a thermal shock caused by a jet of water of about 1mm diameter at a temperature $(10\pm 5)^{\circ}\text{C}$ sprayed on them when they are at maximum service temperature.		N
23.4.7	Test on non-metallic enclosures and of non-metallic parts of enclosures		
23.4.7.1	Ambient temperatures during tests		
	When, according to this European Standard or to the specific European Standards listed in 1.2, tests have to be made as a function of the permissible upper and lower service temperatures of the apparatus, the ambient temperatures shall be:		



Clause	Requirement - Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> for the upper ambient temperature, the maximum service temperature of the apparatus increased by at least 10K but at most 15K 		N
	<ul style="list-style-type: none"> for the lower ambient temperature, the minimum ambient temperature in service(see 5.2) reduced by at least 5K but at most 10K 		N
23.4.7.2	Test of enclosures or parts of enclosures in plastic materials		
	Electrical apparatus of Group I		
	The tests shall be made as follows:		
	<ul style="list-style-type: none"> 2 samples to the tests of thermal endurance to heat (see 23.4.7.3), then the tests of thermal endurance to cold (see 23.4.7.4), then the mechanical tests (see 23.4.7.7) and finally to the tests specific to the type of protection concerned 		N
	<ul style="list-style-type: none"> 2 samples to the tests of resistance to oils and greases (see 23.4.7.6) then to the mechanical tests (see 23.4.7.7) and finally to tests specific to the type of protection concerned 		N
	<ul style="list-style-type: none"> 2 samples shall be submitted to the tests of resistance to hydraulic liquids for mining applications (see 23.4.7.7) and finally to tests specific to the type of protection concerned 		N
	Electrical apparatus of Group II		
	The tests shall be made on 2 samples which shall be submitted to the tests of thermal endurance to heat (see 23.4.7.7) then to thermal endurance to cold (see 23.4.7.4) then to the mechanical tests (see 23.4.7.7) and finally to the tests specific to the type of protection concerned.		P
23.4.7.3	Thermal endurance to heat		
	The enclosures or parts of enclosures in plastics materials on which the integrity of the type of protection depends to continuous storage for four weeks in ambience of $(90\pm 2)\%$ relative humidity and at a temperature of $(20\pm 2)K$ above the maximum service temperature but at least 80°C	2 weeks in 95°C 95%RH 2 weeks 130°C No damage	P

Clause	Requirement - Test	Result - Remark	Verdict
	In the case of a maximum service temperature above 75°C the period of four weeks specified above will be replaced by a period of two weeks at (95±2)°C and (90±2)%relative humidity followed by a period of two weeks at a temperature of (20±2)K higher than the maximum service temperature.		N
23.4.7.4	Thermal endurance to cold		
	The thermal endurance to cold is determined by submitting the enclosures and parts of enclosures in plastics materials on which the type of protection depends to storage for 24 hours in an ambience corresponding to the minimum service temperature reduced according to 23.4.7.1	24h in -40°C	P
23.4.7.5	Resistance to light	Not exposed to direct sunlight	N
	A test of resistance of the material to light shall be made only if the enclosure or parts of enclosures made of plastics materials are not protected from light; for electrical apparatus of Group I, the test applies only to luminaires		P
	The test shall be made on 6 bars of standard size 50x6x4 mm according to ISO 179.		P
	The test bars are to be made under the same conditions as those used for the manufacture of the enclosure concerned.		P
	The test shall be made in accordance with ISO 4892 in an exposure chamber using a xenon lamp and a sunlight simulating filter system, at a black panel temperature of (55±3)°C. The exposure time shall be 1000h.		P
	The evaluation criterion is the impact bending strength in accordance with ISO 179		P
	The impact bending strength following exposure in the case of an impact on the exposed side shall be at least 50% of the corresponding value measured on the unexposed test pieces.		P
	For materials whose impact bending strength cannot be determined prior to exposure because no rupture has occurred, not more than 3 of the exposed test bars may break.		P
23.4.7.6	Resistance to chemical agents for Group I electrical apparatus		
	The plastic enclosures and plastic parts of enclosures shall be submitted to tests of resistance to the following chemical agents:		
	<ul style="list-style-type: none"> oils and greases 		N
	<ul style="list-style-type: none"> hydraulic liquids for mining applications 		N

Clause	Requirement - Test	Result - Remark	Verdict
	The relevant tests shall be made on four samples of enclosure sealed against the intrusion of test liquids into the enclosure:		N
	<ul style="list-style-type: none"> two samples shall remain from (24 ± 2) hours in oil No 2 according to the annex "Reference immersion liquids" of ISO 1817, at a temperature of 50°C. 		N
	<ul style="list-style-type: none"> the two other samples shall remain for (24 ± 2) hours in a fire resistant hydraulic fluid, rated for operating at temperatures between -20°C and $+60^{\circ}\text{C}$, comprising an aqueous solution of polymer in 35% water, at a temperature of $(50 \pm 2)^{\circ}\text{C}$. 		N
	At the end of the test, the enclosure samples shall be removed from the liquid bath, wiped and then stored for (24 ± 2) hours in laboratory atmosphere. Each enclosure shall pass the mechanical tests according to 23.4.7.7.		N
	If one or more of the enclosure samples do not withstand these mechanical tests, special conditions for safe use shall be stated in the certificate and the marking of the electrical apparatus shall include the symbol "X".		N
23.4.7.7	Mechanical tests		
	The mechanical tests specified in 23.4.3 shall be carried out on the enclosures and, additionally, in the case of plastic enclosures, according to 23.4.7.2		P
	The following detailed conditions shall be observed:		
	a) The test for resistance to impact The place of impact shall be on the external parts exposed to impact. If the enclosure of non-metallic material is protected by another enclosure, only the external parts of assembly shall be subjected to the resistance to impact tests. The test shall first be made at the highest temperature, then at the lowest temperature, according to 23.4.7.1.	See clause F.1.1 of EN 50019	P
	b) Drop test The drop test for electrical apparatus which is held in the hand or carried on the person, shall be made at the lowest temperature, according to 23.4.7.1		N
23.4.7.8	Insulation resistance test of parts of enclosures of plastic materials		
	Test piece cleaned with distilled water, then with isopropyl alcohol, then once more with distilled water before being dried.		N

Clause	Requirement - Test	Result - Remark	Verdict
	Test piece with painted electrodes conditioned for 24 hours according to 7.3		N
	Test result see 7.3		N
23.4.7.9	Earth continuity test via non-metallic enclosure		
	The material from which the enclosure is manufactured may be tested as a complete enclosure, a part of an enclosure, or as a sample of the material from which the enclosure is made, provided that the relevant critical dimensions of the sample are the same as those of the enclosure.		N
	The cable gland is represented by a 20mm(nominal) diameter test bar manufactured from brass carrying an ISO metric thread with a tolerance class 6g, 1,5mm pitch (IEC 60423).		N
	Complete earth plates or parts of earth plates that are intended to be used with the enclosure shall be used for this test		N
	If the earth plate is intended to have a clearance hole, the hole provide in the samples used for the test shall be between 22mm and 23mm diameter and the method of assembly shall ensure that the screw thread of the test bar does not make contact directly inside of the clearance hole.		N
	The components are assembled as shown in figure 5. The torque applied to each pair of the nuts in turn shall be 10Nm($\pm 10\%$).		N
	The hole in the wall may be a plain through hole or a tapped hole having a thread form compatible with the test bar.		N
	After the test sample has been assembled it shall be subjected to the conditions for the test for thermal endurance to heat as described in 23.4.7.3.		N
	This shall be followed by a further period of 14 days in an air oven at a temperature of 80°C.		N
	On completion of the conditioning the resistance between the earth plates or parts of earth plates shall be calculated by passing a direct current of 10A between the earth plates and measuring the voltage drop between them.		N
	The plastic material that has been tested in this manner is deemed to be satisfactory if the resistance between the earth plates or parts of earth plates does not exceed 1×10^{-3} ohms.		N

Clause	Requirement - Test	Result - Remark	Verdict
23.4.8	Tests in explosive mixtures		
	The European Standard for the specific type of protection states if tests in explosive mixtures are required and specifies the explosive mixtures.		N
24	Routine verification and tests		
	The manufacturer shall carry out routine verifications and tests necessary to ensure that the electrical apparatus produced complies with specifications submitted to the testing station together with the prototype or sample. He shall also carry out any routine verifications and tests required by the European Standards listed in 1.2	See clause 7 of EN50019	P
25	Manufacturer's responsibility		
	By marking the electrical apparatus in accordance with clause 27 the manufacturer attests on his own responsibility that:		
	<ul style="list-style-type: none"> the electrical apparatus has been constructed in accordance with the principles of good engineering practice in safety matters 		P
	<ul style="list-style-type: none"> the routine verifications and tests in clause 24 have been successfully completed and that the product complies with the specification submitted to the testing station. 		P
26	Verifications and tests on modified or repaired electrical apparatus		
	Modifications made on the electrical apparatus affecting the integrity of the type of protection or the temperature of the apparatus shall be permitted only if the modified apparatus is resubmitted to a testing station.		P
27	SECTION V. MARKING		
27.1	The electrical apparatus shall be marked on the main part in a visible place.		P
	This marking shall be legible and durable taking in to account possible chemical corrosion.		P
27.2	The marking shall include:		
	a) the name of the manufacturer or his registered trade mark	PWL	P
	b) the manufacturer's type identification	SRF and SRM	P
	c) the symbol EEx	EEx	P
	d) the symbol for each type of protection used	e	P

Clause	Requirement - Test	Result - Remark	Verdict
	e) the symbol of the Group of the electrical apparatus	II	P
	f) the symbol indicating the temperature class or the maximum surface temperature in °C, or both	T6-T5	P
	g) A serial number	A batch number is put on the cable	P
	h) the name or mark of the testing station and the certificate reference	Nemko 03ATEX1279X	P
	i) special conditions for safe use "X"	X	P
	j) Any additional marking prescribed in the specific European Standards for the types of protection concerned		N
	k) Any marking normally required by the standards of construction of the electrical apparatus.		N
	Where reference is made to Directive 94/9/EC, Items a) above shall not apply, and shall be replaced by the following:		
	<ul style="list-style-type: none"> The name and address of the manufacturer 	Not possible (PWL is applied)	P
	The marking shall also include:		
	<ul style="list-style-type: none"> the year in which the equipment was constructed 		
	<ul style="list-style-type: none"> the specific marking of explosion protection  followed by the symbol of the equipment group and the Category 	 II2	P
	for equipment Group II:		
	<ul style="list-style-type: none"> the letter 'G' where explosive atmospheres caused by gases, vapours or mists are concerned and/or 	G	P
	<ul style="list-style-type: none"> the letter 'D' where explosive atmospheres caused by dusts are concerned 		N
27.3	Where different types of protection are used on different parts of an electrical apparatus, each respective part shall bear the symbol of the type of protection concerned.		N
	Where more than one type of protection is used in an electrical apparatus, the symbol for the main protection shall appear first and be followed by the symbols the other types of protection used.		N
27.4	The markings (c) to (f) according to 27.2 shall be placed in the order which they are given.	Not possible	N
27.5	Ex components according to clause 13 shall be marked in a visible place.		N

Clause	Requirement - Test	Result - Remark	Verdict
	This marking shall be legible and durable and shall include:		N
	a) the name of the manufacturer or his registered trade mark		N
	b) the manufacturer's type identification		N
	c) the symbol EEx		N
	d) the symbol for each type of protection used		N
	e) the symbol of the Group of the electrical apparatus		N
	f) the name or mark of the testing station		N
	g) the certificate reference followed by the symbol "U" the symbol "X" shall not be used		N
	h) the additional marking prescribed in the specific European Standard for the types of protection concerned.		N
	i) the marking normally required by the standards for construction of the Ex-component.		N
27.6	On very small electrical apparatus and on Ex-components where there is limited space, the testing station may allow a reduction in the marking but will require at least:		
	a) the name or the registered trade mark of the manufacturer	PW	P
	b) the symbol EEx and the symbol of the type of protection	EEx	P
	c) the name or mark of the testing station	0470	P
	d) the certificate reference	Nemko03ATEX1279X	P
	e) for electrical apparatus, the symbol "X" if appropriate or for Ex-components , the symbol "U"	X	P
27.7	Examples of marking	No requirements in this clause	
28	INSTRUCTIONS		
28.1	All equipment shall be accompanied by instructions, including at least the following particulars:		
	<ul style="list-style-type: none"> a recapitulation of the information with which the equipment is marked, except for the serial number, together with any appropriate additional information to facilitate maintenance 		P
	Instruction for safe:		
	<ul style="list-style-type: none"> putting into service 		P

Clause	Requirement - Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> use 		P
	<ul style="list-style-type: none"> assembling and dismantling 		P
	<ul style="list-style-type: none"> maintenance (servicing and emergency repair) 		P
	<ul style="list-style-type: none"> installation 		P
	<ul style="list-style-type: none"> adjustment 		P
	<ul style="list-style-type: none"> where necessary, training instructions 		N
	<ul style="list-style-type: none"> details which allow a decision to be taken beyond any doubt as to whether an item of equipment in a specific category or a protective system can be used safely in the intended, area under the expected operating conditions. 		N
	<ul style="list-style-type: none"> electrical and pressure parameters, maximum surface temperatures and other limit values 		N
	<ul style="list-style-type: none"> where necessary, special conditions of use, including particulars of possible misuse which experience has shown might occur 		N
	<ul style="list-style-type: none"> where necessary, the essential characteristics of tools which may be fitted to the equipment. 		N
28.2	The instructions shall contain the drawings and diagrams necessary for the putting into service, maintenance, inspection, checking of correct operation and, where appropriate, repair of the equipment, together with all useful instructions, in particular with regard to safety.		P
	ANNEX B, Ex CABLE ENTRIES		
B.1	GENERAL		
B.1.1	This annex specifies the general requirements for the construction, testing and marking of Ex cable entries and may be supplemented or modified by the European Standards listed in 1.2	Certified cable entries will be used	N
B.2	Constructional requirements		
B.2.1	Cable sealing		
B.2.1.1	The cable sealing between the cable and the entry body shall be ensured by one of the following means:		
	<ul style="list-style-type: none"> an elastomeric sealing ring 		N
	<ul style="list-style-type: none"> a metallic or composite sealing ring 		N
	<ul style="list-style-type: none"> a filling compound 		N

Clause	Requirement - Test	Result - Remark	Verdict
	The cable sealing may be made of a single material or a combination of materials and		N
	shall be appropriate to the shape of the cable concerned.		N
B.2.2	Materials		
B.2.2.1	The requirements relating to materials of sub-clause 7.3 concerning electrostatic charges apply only to exposed parts of cable entries		N
B.2.2.2	Elastomeric sealing rings shall be made of materials, which satisfy the type test for resistance of ageing as defined in B.3.3.		N
B.2.2.3	Materials used, as filling compounds shall comply with the requirements of clause 12 for materials used for cementing.		N
B.2.3	Clamping		
B.2.3.1	Cable entries shall provide clamping of the cable in order to prevent pulling or twisting applied to from being transmitted to the connections.		N
	It shall be capable of meeting the relevant type tests in B.3.		N
B.2.3.2	Group II cable entries without a clamping device may also be accepted as complying with this Annex if they are capable of passing the clamping tests with values reduced to 25% of those required in B.3		N
	The descriptive documents shall then state that such cable entries may be used only for fixed installations of Group II and that the user shall ensure adequate clamping of the cable.		N
	Such cable entries shall be marked with symbol "X".		N
B.2.4	Lead in of cable		
B.2.4.1	Cable entries shall not have sharp edges capable of damaging the cable		N
B.2.4.2	In the case of flexible cables, the point of entry shall include a rounded edge at an angle of at least 75 degrees.		N
	The radius R of which is at least equal to one quarter of the diameter of the maximum admissible cable in the entry but which need not exceed 3mm.		N
B.2.5	Cable entries shall be so designed so that after installation they can only be released or dismantled by means of a tool.		N

Clause	Requirement - Test	Result - Remark	Verdict
B.2.6	The means of fixing cable entries to enclosures shall be capable of retaining the cable entry when subjected to the mechanical tests of clamping and resistance to impact in B.3.		N
B.2.7	Cable entries shall be capable of providing with enclosure on which they are fixed, the same degree of protection as required for the enclosure See B.3.5.		N
B.3	TYPE TESTS		
B.3.1	Test of clamping of non-armoured and braided cables		N
B.3.1.1	Cable entries with clamping by the sealing ring		N
	The tests of clamping shall be carried out using for each type of cable entry 2 sealing rings: one equal to the smallest admissible size and other equal to the greatest admissible size		N
	In the case of elastomeric sealing rings for circular cables, each ring is mounted on a clean , dry, polished cylindrical mild steel mandrel equal to the smallest cable diameter allowable in the ring and specified by the manufacturer of the cable entry		N
	For non-circular cables, the ring shall be mounted on a sample of dry, clean cable of dimension equal to the size specified by the manufacturer of the cable entry.		N
	In the case of metallic sealing rings, each ring is mounted on a sample of clean, dry cable of a diameter equal to the smallest diameter allowable in the ring and specified by the manufacturer of the cable entry.		N
	A torque is applied to the screws or to the nut in order to obtain the compression of the sealing ring and prevent slipping of the mandrel or cable when the force applied to it is the value in Newtons equal to:		
	<ul style="list-style-type: none"> 20 times the value in millimetres of the diameter of the mandrel or cable when the cable entry is designed for round cable or 		N
	<ul style="list-style-type: none"> 6 times the value in millimetres of the perimeter of the cable entry is designed for non-circular cable 		N
B.3.1.2	Cable entries with clamping by filling compound		
	The tests of clamping shall be carried out using two samples of clean, dry cable; one equal to the smallest admissible size and the other equal to the greatest admissible size		N

Clause	Requirement - Test	Result - Remark	Verdict
	The filling compound shall prevent slipping of the cable when the force applied to it is the value in Newtons equal to:		
	<ul style="list-style-type: none"> 20 times the value in millimetres of the diameter of the mandrel or cable when the cable entry is designed for circular cable or 		N
	<ul style="list-style-type: none"> 6 times the value in millimetres of the perimeter of the cable entry is designed for non-circular cable 		N
B.3.1.3	Cable entries with clamping by means of a clamping device		
	The test of clamping shall be carried out using for each type of cable entry clamping devices of the different allowable sizes.		N
	The clamping device with the cable and the sealing ring whose size is equal to the largest size of cable allowable in that ring specified by the manufacturer of the cable entry, are then fitted in the cable entry; the entry is then assembled with compression of the sealing ring and tightening of the clamping device.		N
	A torque is applied to the screws or to the nut in order to obtain the compression of the sealing ring and prevent slipping of the mandrel or cable when the force applied to it is the value in Newtons equal to:		
	<ul style="list-style-type: none"> 20 times the value in millimetres of the diameter of the mandrel or cable when the cable entry is designed for round cable or 		N
	<ul style="list-style-type: none"> 6 times the value in millimetres of the perimeter of the cable entry is designed for non-circular cable 		N
B.3.1.4	Tensile test		
	The prepared sample is mounted on a tensile testing machine and a constant force equal to that defined above is then applied for 6 hours. The test is carried out at ambient temperature (20 ± 5)°C.		N
	The clamping assured by the sealing ring, filling compound, or by the clamping device is acceptable if slipping of the mandrel or cable sample is not more than 6mm.		N
B.3.1.5	Mechanical strength		
	After the tensile test, the cable entry is removed from the tensile testing machine and submitted to the following tests and examinations, as appropriate		

Clause	Requirement - Test	Result - Remark	Verdict
B.3.1.5.1	In the case of cable entries with clamping by sealing ring or a clamping device, a mechanical strength test on which a torque of 1,5 times the value needed to prevent slipping is applied to the screws or nuts. The cable entry is then dismantled and the components examined.		N
	The mechanical strength of the cable entry is acceptable if no deformation affecting the type of protection is found.		N
	Any deformation of the sealing ring shall be ignored.		N
	Where cable entries are manufactured from plastics material, if the prescribed proof torque cannot be met due to temporary deformations of the thread, and no noticeable damage is found, the cable entry shall be deemed to have passed the test		N
B.3.1.5.2	In the case of cable entries with clamping by filling compound, the gland is dismantled as far as possible without damaging the filling compound. Upon examination there must be no physical or visible damage to the filling compound which would affect the type of protection afforded		N
B.3.2	Tests of clamping of armoured cables		
B.3.2.1	Tests of clamping where the armouring are clamped by a device within the gland		
B.3.2.1.1	The tests shall be carried out using for each size of entry a sample of armoured cable of the smallest size specified.		N
	The sample of armoured cable is fitted into the clamping device of the cable entry. A torque is then applied to the screws or to the nut in order to compress the clamping device and prevent slipping of the armour when the force applied to it equal to:		N
	<ul style="list-style-type: none"> 80 times the value in millimetres of the diameter of the cable over the armour for Group I, or 		N
	<ul style="list-style-type: none"> 20 times the value in millimetres of the diameter of the cable over the armour for Group II 		N
B.3.2.1.2	Tensile test		
	The prepared sample is mounted on a tensile testing machine and a constant tensile force equal to that defined above is then applied for 2 minutes \pm 10s.		N
	Ambient temperature (20 \pm 5) $^{\circ}$ C		N

Clause	Requirement - Test	Result - Remark	Verdict
	The clamping assured by the clamping device is acceptable if the slipping of the armour is effectively zero		N
B.3.2.1.3	Mechanical strength		
	Where screws and nuts are fitted they shall be tightened to 1,5 times the values in B.3.2.1.1 and then the cable entry dismantled.		N
	The mechanical strength is acceptable if no deformation affecting the type of protection is found.		N
B.3.2.2	Tests of clamping where the armouring are not clamped by a device within the gland		
	The cable entry shall be treated as if it is a non armoured type according to B.3.1		N
B.3.3	Ageing test for material used for elastomeric sealing rings		
	Test pieces in accordance with the standards ISO 48 and ISO 1818		N
	The hardness is determined in accordance with the same standards at ambient temperature		N
	The test piece is the placed in an oven in which the temperature is maintained at $(100 \pm 5)^{\circ}\text{C}$ without interruption		N
	then they are then kept for at least 24 hours at ambient temperature		N
	then placed in a refrigerator in which the temperature is maintained at $(-20 \pm 2)^{\circ}\text{C}$ for at least 48 hours without interruption		N
	they are finally kept for at least 24 hours at ambient temperature.		N
	The hardness is then determined again. At the end of the test procedure the variation in hardness, expressed in IRHD units as specified in the ISO standards given above, shall not exceed 20% of the hardness before ageing		N
	Where a cable entry is intended to be used at temperature above that foreseen in 16.8, the ageing test shall be carried out at a temperature $(20 \pm 5)\text{K}$ above the declared maximum operating temperature at the branching point of the conductors. Where a cable entry is intended to be used in an ambient temperature below -20°C , the test in the refrigerator shall be carried out at the declared minimum ambient temperature, with a tolerance of $\pm 2^{\circ}\text{C}$.		N

Clause	Requirement - Test	Result - Remark	Verdict
B.3.4	Type test for resistance to impact		
	The test shall be carried out by applying the appropriate requirements according to 23.4.3. The cable entry shall be tested with the smallest specified cable fitted		N
	For testing purposes, the cable entry is fixed on a rigidly mounted steel plate or secured as specified by the manufacturer of the cable entry.		N
	The torque applied in fixing the threaded cable entry shall be according to B.3.1.5 or B.3.2.1.1 as appropriate.		N
B.3.5	Type test for degree of protection (IP) of cable entries		
	The test shall be carried out following the conditions given in EN 60529, using for each type of cable entry, one cable ring of each of the different permitted sizes.		N
	For sealing test, each sealing ring is mounted on a sample of clean, dry cable of a diameter equal to the smallest diameter allowable in the ring as specified by the manufacturer of the cable entry. The cable entry with cable is tested after being fixed to a sealed enclosure		N
B.4	MARKING		
B.4.1	Marking of cable entries		
	Cable entries shall be marked in accordance with 27.2. and,		N
	if a threaded entry, with the type and size of thread.		N
	Where marking space is limited the reduced marking requirements of 27.6 may be applied.		N
B.4.2	Marking of cable sealing rings		
	The cable sealing rings of cable entries allowing a series of rings shall bear the indications of the minimum and maximum diameters, expressed in millimetres, of the permitted cables.		N
	When the cable sealing ring is bound with a metal washer, the marking may be made on the washer.		N
	The cable sealing rings shall carry an identifying marking allowing the user to determine if the ring is appropriate for the cable entry		N

Clause	Requirement - Test	Result - Remark	Verdict
	Where the entry and the ring are intended to be used at temperatures outside the range -20°C to + 80°C and have been tested accordingly, as specified in B.3.3, they shall be marked with the temperature range.		N

Clause	Requirement - Test	Result - Remark	Verdict
1	Scope	The equipment is covered by this standard.	
3	Definitions	This clause contains no requirements.	
4	CONSTRUCTIONAL REQUIREMENTS FOR ALL ELECTRICAL APPARATUS		
	The requirements of this clause apply, unless otherwise stated in clause 5, to all electrical apparatus with type of protection "e". They are additional to the general requirements of EN 50014 (see clause 1) and are themselves supplemented for certain electrical apparatus by supplementary requirements in clause 5.		P
4.1	Terminals for external connections		
		Certified components will be used	P
4.2	Internal connections (integral part of the apparatus)		N
4.3	Clearances		N
4.4	Creepage distances		N
4.4.1			
4.4.2			
4.4.3			
4.5	Solid electrical insulating materials		N
4.5.1			
4.5.2			
4.6	Windings		N
4.6.1			
4.6.1.1			
4.6.1.2			
4.6.2			
4.6.3			
4.6.4			
4.7	Temperature limitations		N
4.7.1			
4.7.2			
4.7.3			
4.7.4			
4.8	Internal wiring		N

Clause	Requirement - Test	Result - Remark	Verdict
4.9	Degrees of protection provided by enclosures		N
4.9.1			
4.9.2			
4.9.3			
4.10	Fasteners		N
5	Supplementary requirements for specific electrical apparatus		N
5.1	Rotating electrical machines		N
5.1.1	Degrees of protection provided by enclosure		N
5.1.2	Internal fans		N
5.1.3	Minimum radial air gap		N
5.1.4	Machines with cage rotors		N
5.1.4.1			
5.1.4.2			
5.1.4.3			
5.1.4.4			
5.1.4.5			
5.1.4.6			
5.2	Luminaires designed for mains supply		N
5.2.1			
5.2.2			
5.2.3			
5.2.4			
5.2.5			
5.2.6			
5.3	Caplamps and hand lamps with their own source of supply		N
5.4	Measuring instruments and instrument transformers		N
5.4.1			
5.4.2			

Clause	Requirement - Test	Result - Remark	Verdict
5.4.3			
5.4.4			
5.4.5			
5.4.6			
5.5	Transformers other than instrument transformers		N
5.6	Cells and batteries		N
5.6.1	Acceptable electrochemical systems		N
5.6.2	Classification		
5.6.3	General Requirements		N
5.6.3.1			
5.6.3.2			
5.6.3.3			
5.6.3.4			
5.6.3.5			
5.6.3.6			
5.6.3.7			
5.6.3.8			
5.6.3.9			
5.6.3.10			
5.6.3.11			
5.6.4	Charging in hazardous areas		N
5.6.4.1			
5.6.4.2			
5.6.4.3			
5.6.4.4			
5.6.4.5			
5.6.5	Discharge og cells		N
5.6.5.1			
5.6.5.2			
5.6.5.3			
5.6.5.4			
5.6.5.5			
5.6.6	Incorporation of other protection concepts		N

Clause	Requirement - Test	Result - Remark	Verdict
5.6.6.1			
5.6.6.2			
5.6.7	Disconnection and transportation		N
5.6.7.1			
5.6.7.2			
5.6.8	Additional requirements for specific types of cells and batteries		N
5.6.8.1	Battery containers		N
5.6.8.1.1			
5.6.8.1.2			
5.6.8.1.3			
5.6.8.1.4			
5.6.8.1.5			
5.6.8.1.6			
5.6.8.1.7			
5.6.8.1.8			
5.6.8.1.9			
5.6.8.1.10			
5.6.8.2	Cells		N
5.6.8.2.1			
5.6.8.2.2			
5.6.8.2.3			
5.6.8.2.4			
5.6.8.2.5			
5.6.8.2.6			
5.6.8.2.7			
5.6.8.3	Connections		N
5.6.8.3.1			
5.6.8.3.2			
5.6.8.3.3			
5.6.8.3.4			
5.6.8.3.5			
5.7	General purpose connection and junction boxes		N
5.8	Resistance heating devices and resistance heating units		N

Clause	Requirement - Test	Result - Remark	Verdict
5.8.1			
5.8.2			
5.8.3			
5.8.4			
5.8.5			
5.8.6			
5.8.7			
5.8.8			
5.8.9			
5.8.10			
5.8.11			
5.9	Other electrical apparatus		N
6	Type verifications and type tests		N
6.1	Electrical strength		
		See Annex F	P
6.2	Rotating electrical machines		N
6.2.1			
6.2.2			
6.3	Luminaires designed for mains supply		N
6.3.1	Mechanical tests for screw lampholders		N
6.3.2	Thermal test for luminaires with tubular fluorescent lamps		N
6.3.3	Sulphur dioxide test for bi-pin lamp caps/lampholders		N
6.3.4	Vibration tests for luminaries with bi-pin lamp caps/lampholders		N
6.4	Measuring instruments and instrument transformers		N
6.4.1			
6.4.2			
6.4.3			
6.5	Transformers other than instrument transformers		N

Clause	Requirement - Test	Result - Remark	Verdict
6.6	Secondary batteries		N
6.6.1	Insulation resistance		N
6.6.1.1			
6.6.1.2			
6.6.2	Shock test		N
6.6.2.1	Test conditions		N
6.6.2.2	Test procedure		N
6.6.2.3	Acceptance criteria		N
6.6.3	Test for adequate ventilation of battery container		N
6.6.3.1			
6.6.3.2			
6.6.3.2.1	Method 1		
6.6.3.2.2	Method 2		
6.6.3.3			
6.6.3.4			
6.6.3.5			
6.6.3.6			
6.7	General purpose connection and junction boxes		N
6.8	Resistance heating devices and resistance heating units		N
6.8.1			
6.8.2			
6.8.3			
6.8.4			
6.8.5			
7	Routine verifications and routine tests		
7.1	Electric strenght test (1000V + 2U) +5%	(1000+2x240)+5% = 1554V	P
7.2			N

Clause	Requirement - Test	Result - Remark	Verdict
7.3			N
8	Marking		
8.1	a) rated voltage rated current and/or power	240V 10, 16, 24, 30, 50W/m	P
8.2			N
8.2.1			N
8.2.3			N
	ANNEX B		
	Lampholders and lamp caps for luminaires designed for mains supply		
B.1	Screw lampholders and screw lamp caps		
B.1.1			N
B.1.2			N
B.1.3			N
B.1.4			N
B.2	Other lampholders and lamp caps		
B.2.1			N
B.2.2			N
B.3	Lampholders and lamp caps for tubular fluorescent lamps		
B.3.1			N
B.3.2			N
B.3.2.1			N
B.3.2.2			N
B.3.2.3			N
B.3.2.4			N
B.3.2.5			N
B.3.2.6			N
B.3.2.7			N
B.3.2.8			N
B.4	Requirements for current transfer		
B.4.1			N
B.4.2			N
	Annex E		
	Cage motors- Methods of test and of calculation		
E.1			N
E.2			N

Clause	Requirement - Test	Result - Remark	Verdict
E.3			N
E.3.1			N
E.3.2			N
E.3.3			N
E.3.4			N
E.3.5			N
E.4			N
E.4.1			N
E.4.2			N
E.5			N
E.6			N
E.7			N
	ANNEX F		
	Type tests for specific forms of resistance heating device and/or resistance heating unit		
F.1	Resistance heating devices or units subjected to mechanical stresses		
	Resistance heating devices or units which may be subjected to mechanical stress for example, by crushing or bending during installation shall be submitted to the following crushing and low temperature bend test.		P
F.1.1	Crushing test		
	Placed on rigid flat steel support Crushing force: 1500N Duration: 30s Steel rod: 6mm Followed by voltage test acc. to 6.8.2a) and b) a) R.M.S voltage (500 +2U ₁): V Duration: 60s No breakdown b) D.C voltage 500V Insulation resistance >1,5MΩ.km	980V No breakdown occurred SRL10-2CR → 15MΩ.km SRL30-2CT → 9MΩ.km SRL10-2CT → 15MΩ.km SRL30-2CR → 10MΩ.km SRL50-2CR → 100MΩ.km	P

Clause	Requirement - Test	Result - Remark	Verdict
F.1.2	Low temperature bend test		
	Sample placed in refrigerator. Placed in apparatus for 4h Temperature °C Madrel diameter mm Followed by voltage test acc. to 6.8.2a) and b) a) R.M.S voltage (500 +2U ₁): V Duration: 60s No breakdown b) D.C voltage 500V Insulation resistance >1,5MΩ.km	-40°C SRL10-30 35mm SRL50 50mm 980V No breakdown SRL10-2CR → 20MΩ.km SRL30-2CT → 8MΩ.km SRL10-2CT → 18MΩ.km SRL30-2CR → 9MΩ.km SRL50-2CR → 150MΩ.km	P
F.2	Resistance heating devices or units intended for immersion		
	Sample or part of sample immersed in tap water Duration of immersion 14x24h Followed by voltage test acc. to 6.8.2a) and b) a) R.M.S voltage (500 +2U ₁): V Duration: 60s No breakdown b) D.C voltage 500V Insulation resistance >MΩ		N
F.3	Resistance heating devices or units having hygroscopic insulating material		
	Sample placed in humidity chamber Duration: 14x24h Temperature: 80±2°C Humidity: >90% R.H Followed by voltage test acc. to 6.8.2a) and b), omitting the water immersion. a) R.M.S voltage (500 +2U ₁): V Duration: 60s No breakdown b) D.C voltage 500V Insulation resistance >1,5MΩ.km	980V No breakdown SRL10-2CR → 18MΩ.km SRL30-2CT → 10MΩ.km SRL10-2CT → 16MΩ.km SRL30-2CR → 8MΩ.km SRL50-2CR → 120MΩ.km	P

Clause	Requirement - Test	Result - Remark	Verdict
F.4	Verification of limiting temperature		
			P
F.4.1	Resistance heating unit protected by a protective system according to 5.8.9		
			N
F.4.1.1	Protective system sensing the temperature		
			N
F.4.1.2	Protective system sensing the temperature and at least one other parameter		
			N
F.4.1.3	Protective system sensing (a) parameter(s) other than the temperature		
			N
F.4.2	Resistance heating unit of stabilized design		
			N
F.4.3	Heating device with self-limiting characteristic		
	Sample being close-coiled inside a close-fitting box of thermally insulating material. Sample length: 3–4m Voltage (rated voltage +10%) V Temperature: -20±3°C Maximum temperature: °C	264V SRL10-2CR → 75°C SRL30-2CT → 75°C SRL10-2CT → 75°C SRL30-2CR → 87°C SRL50-2CR → 101°C	P
		This test was also carried out using a test voltage of 277V Then SRL30-2CR → 88°C SRL50-2CR → 102°C	P

Description of the apparatus:

